

Application No. 10/664,301
Docket No. 2002U023.US
Reply to Office Action Dated August 19, 2005

Amendments to the Specification

(Previously presented)

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to U.S. Provisional patent application U.S.S.N. 60/437,695 filed December 31, 2002.

(Currently Amended)

[0007] In one embodiment, the High MFR catalyst is a cyclic bridged metallocene; the cyclic bridged metallocene characterized in that it is capable of producing polyethylene with an MFR of 50 dg/min or more when activated and is the only catalyst present in a reaction mixture that includes ethylene monomers and is subjected to a gas phase polymerization; and wherein the Low MFR catalyst is a bridged metallocene; the bridged metallocene characterized in that it is capable of producing polyethylene with an MFR of less than 50 dg/min when activated and is the only catalyst present in a reaction mixture that includes ethylene monomers and is subjected to a gas phase polymerization.

(Currently amended)

[0008] Another aspect of the present invention provides for a process of polymerizing olefins using the mixed catalyst system of the invention and the bimodal polyethylene produced therefrom, the bimodal polyethylene in one embodiment having a density of from 0.910 to 0.930 g/cm³; a melt index (I_2) of from 0.3 to 3 dg/min; a flow index (I_{21}) of from 10 to 150 dg/min; and a melt flow rate ratio (MFR I_{21}/I_2) of from 10 to 80.

(Currently amended)

[0017] ~~scribed~~ Described another way, the mixed catalyst system of the present invention is formed by combining a HMC with an activator and a support, and optionally a first diluent, to form an activated High MFR catalyst system, the activated High MFR catalyst system comprising the activator and High MFR Catalyst bound to the support; followed by combining: (i) a diluent comprising mineral or silicon oil to the activated

Application No. 10/664,301
Docket No. 2002U023.US
Reply to Office Action Dated August 19, 2005

High MFR catalyst system to form a first support slurry; this then followed by combining a LMC with the first support slurry; or in another embodiment, (ii) a diluent comprising mineral or silicon oil and a LMC are combined to the activated High MFR catalyst system to form the mixed catalyst system or "activated, supported mixed catalyst system". In one embodiment, the diluent consists of mineral oil.

(Currently amended)

[0028] As discussed in detail below, the HMC is preferably a cyclic bridged metallocene that is capable of producing polyethylenes with high melt flow ratio rate (e.g., 50 dg/min or higher), but low melt strength (e.g., 6 cN or lower). In at least certain embodiments, the LMC is capable of producing polyethylenes with high melt strength, such as the germanium or silicon bridged metallocenes described below. Preferably, the two catalyst compounds are not contacted with one another prior to the combination of the HMC with the activator and support. It is contemplated that avoiding such contact until after combining the HMC with the activator and support provides an improved mixed catalyst system; and that interactions between the catalysts create undesired deviations in the catalysts' expected behavior. On the other hand, contacting the HMC with a support and activator followed by, with or without isolation, contacting that supported activated catalyst with a LMC (preferably without activator) has been found to provide mixed catalyst systems with improved properties.

(Currently amended)

[0030] The terms "High Melt Flow Ratio Rate Catalyst," "High MFR Catalyst," and "HMC" mean a catalyst compound capable of producing a polymer with a higher melt flow ratio rate (MFR) than that of a polymer produced under similar conditions using a Low Melt Flow Ratio Rate Catalyst. In various specific embodiments, the HMC is capable of producing polymers having a MFR of 35 dg/min or more; or 40 dg/min or more; or 45 dg/min or more; or 50 dg/min or more; or 60 dg/min or more. The "polymer" is preferably a polyolefin, and more preferably polyethylene, including polyethylene copolymers.

Application No. 10/664,301
Docket No. 2002U023.US
Reply to Office Action Dated August 19, 2005

(Currently amended)

[0032] The HMC, in one embodiment, is a cyclic bridged metallocene compound that, when activated with a suitable activator, is capable of producing a polyethylene homopolymer or copolymer in a gas phase process having a high melt flow ratio rate (MFR), that is, having an MFR of greater than 50 dg/min in one embodiment. Preferably, the HMC is also a Low Melt Strength Catalyst, as defined herein. For example, a preferred HMC is silylcyclopentyl(tetramethylcyclopentadienyl)(cyclopentadienyl) zirconium dichloride.

(Currently amended)

[0043] The terms "Low Melt Flow Ratio Rate Catalyst," "Low MFR Catalyst," and "LMC" mean a catalyst compound capable of producing a polymer with a lower melt flow ratio rate (MFR) than that of a polymer produced under similar conditions using a High Melt Flow Ratio Rate Catalyst. In various specific embodiments, the LMC is capable of producing polymers having a MFR of 40 dg/min or less; or 30 dg/min or less; or 25 dg/min or less; or 20 dg/min or less. The "polymer" is preferably a polyolefin, and more preferably polyethylene, including polyethylene copolymers.